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The American Fertilizer

Vol. 100 JANUARY 15, 1944 No. 2

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See page 25

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AMERICAN FERTILIZER

"That man is a benefactor to his race who makes two blades of grass to grow where but one grew before."

Vol. 100 JANUARY 15, 1944 No. 2

Nitrogenous Fertilizers For Direct Application*

By C. W. WHITTAKER and A. L. MEHRING

Division of Soil and Fertilizer Investigations, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, Beltsville, Maryland

NORMALLY about one-half of the total consumption of commercial fertilizer nitrogen is in the form of materials for direct application. Various materials, including sodium nitrate, ammonium sulphate, Cyanamid, Uramon and Cal-Nitro have been successfully used for top- or side-dressings.

In general, equal quantities of nitrogen from these different sources are about of equal value in increasing crop yields, although one or the other may be given preference for certain soil, crop or climatic conditions. Under most conditions one form can be successfully substituted for another, so that the total supply is much more important in times like these than the supply of any single nitrogenous material.

Supply Situation—1943-44

The total tonnage of nitrogen consumed in the form of separate materials for direct application in the continental United States from 1935 to 1943, inclusive, and the expected supply for 1944 are shown in Fig. 1. For many years, with a few exceptions, annual consumption of nitrogen for this purpose has varied between 150,000 and 200,000 tons. In addition, from 15,000 to 20,000 tons annually are used in the same way in Hawaii and Puerto Rico together. The highest consumption for direct application ever attained was about 234,000 tons in 1940–41, of which 20,000 tons were used in the Territories.

From present indications 271,000 tons of chemical nitrogen will be available for top- and side-dressing purposes in continental United States in the 1943–44 fertilizer year. This is one-third more than was available in the year ended June 30, 1943, nearly twice as much as was available in 1941–42 and 35 per cent more than in any previous year. About 27,000 tons of chemical nitrogen are expected to be available for all purposes in the Territories.

The quantities of chemical nitrogen available in different forms for direct use in agriculture in the continental United States are shown in Table I for several fertilizer seasons. The expected supply of sodium nitrate for the present season ending June 30, 1944, is slightly larger than in most recent years, but sodium nitrate will furnish only half of the total as compared with two-thirds during the past season. The indicated supply includes Chilean, synthetic and by-product sodium nitrate. Relatively much less ammonium sulphate will be available for direct use, because a larger part of the total supply must be set aside for the manufacture of mixed fertilizers. There will be larger supplies of Uramon, Cyanamid and ammonium phosphate in 1943–44 than in the past two years. Cal-Nitro, 30,000 to 70,000 tons of which was formerly imported annually from Norway and Germany, is now being manufactured in this country. It is believed that 50,000 tons or more will be provided for sale as such to farmers during the present season. This material contains 20.5 percent nitrogen and is a mixture of dolomite and ammonium nitrate.

About 230,000 tons of ammonium nitrate have been allocated for sale direct to farmers in the 1943–44 season. Although this material has been used extensively for years in manufacturing mixed fertilizers, in field experiments and for direct use in such forms as Cal-Nitro, it is practically a new material when used in a

*Reprinted from "The Fertilizer Review."

relatively pure form for direct application to the soil.

Production of Ammonium Nitrate

Ammonium nitrate is being produced by a number of government plants both in this country and in Canada for fertilizer use, as well as by a privately owned plant in California. The material produced by the Tennessee Valley Authority and other United States Government plants is being marketed as "Ammonium Nitrate Fertilizer." The Canadian product is being offered under the trade name "Nitraprills." All ammonium nitrate fertilizers produced after December 1, 1943, will be guaranteed to contain 32.5 per cent nitrogen. Most of the material produced in the last two months of 1943 and all of the material produced in 1944 will be of improved types as described in this article.

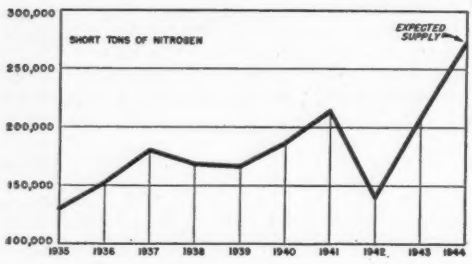

Fig. 1. Total Nitrogen Content of Materials Sold Separately to Farmers in Continental United States—Fiscal Years Ended June 30

Due to the general unfamiliarity of the public with ammonium nitrate and some unfortunate experiences with improperly conditioned material, it is believed worthwhile to devote the remainder of this discussion to the properties and agronomic value of the ammonium nitrate fertilizer that will be offered this season.

Conditioning Ammonium Nitrate

Ammonium nitrate has two properties that have tended to discourage its use as a fertilizer. It absorbs moisture more readily from the air than most fertilizer materials and it tends to cake in storage. As a result of research work by manufacturers and by the United States Department of Agriculture, the new forms of ammonium nitrate are given a treatment to overcome partially these undesirable properties. This treatment or conditioning consists of two main steps—granulation of the product to give essentially round particles with elimination of most of the fine particles, and coating the resultant granules with suitable materials to reduce moisture absorption and caking. Granulation of fertilizer materials reduces their tendency to cake and makes them easier to distribute in fertilizer drills or by hand. After granulating, the particles are coated with a wax and an inert mineral powder. The wax reduces moisture absorption and, in combination with the dusting agent, further reduces caking on storage. These combined treatments of granulation or graining, waxing and dusting are quite effective in improving the physical properties of the ammonium nitrate.

As a further protection against moisture absorption ammonium nitrate fertilizers are shipped in "moisture-proof" bags. These are of several types. One type is a multi-ply paper bag, one or more plies of which have been impregnated with a moisture-resistant material. Burlap and cotton bags are also used but these are lined with paper with a layer of asphaltic material between the paper and the cloth.

Although two of the new types of ammonium nitrate are granulated they differ somewhat in the size of the granules. The product of the Tennessee Valley Authority contains about 35 per cent of material larger than 20 mesh, 50 per cent of 20–40 mesh material and 15 per cent that is smaller than 40 mesh. The Canadian material has a higher percentage of large particles; 80 per cent of this material is larger than 20 mesh and only 5 per cent or less is smaller than 40 mesh. One of the Canadian plants and the one in California are producing other types of well-

TABLE I

SUPPLIES OF CHEMICAL NITROGEN FOR DIRECT APPLICATION IN CONTINENTAL UNITED STATES

	1940–41		1942–43		1943–44*	
Material	Tons N	Per cent	Tons N	Per cent	Tons N	Per cent
Sodium Nitrate	127,000	63.5	140,000	68.6	133,000	49.1
Ammonium Sulphate	37,000	18.5	33,000	16.2	22,000	8.1
Other Chemical N	36,000	18.0	21,000	10.2	41,000	15.1
Ammonium Nitrate	0	0	10,000	5.0	75,000	27.7
Total	200,000	100	204,000	100	271,000	100

*Expected.

conditioned ammonium nitrate. Most of that production will be sold in the West while the two granular materials will be used in the Eastern and Southern States.

Storage Tests

Tests of the ability of the ammonium nitrate fertilizers to withstand storage without undue caking are being made, both in the laboratories of the United States Department of Agriculture under controlled conditions, and with larger lots of material in bags under actual storage conditions. These latter tests are being made in fertilizer factories in several localities to show the effect of varying climatic factors. These practical tests, which have now been running three to four months, show that the granulation and other treatments given the ammonium nitrates have greatly reduced the tendency of the ammonium nitrate fertilizers to cake. These materials can be stored without undue caking under good average storage conditions.

Drilling Properties of Ammonium Nitrate Fertilizers

The relative ease with which the ammonium nitrate fertilizers pass through fertilizer distributing equipment under adverse conditions is also being tested. In these tests the materials to be studied are exposed to high relative humidities and temperatures characteristic of summer and observations made to determine which treatments will maintain their ability to pass through various types of distributing mechanisms at a constant rate for the longest time. The experiments indicate that the improved types of ammonium nitrate can be used in fertilizer distributors as satisfactorily as some of the more common nitrogen fertilizers. Distributors with a positive feed mechanism handle ammonium nitrate and other fertilizers better than those of the "gravity-feed" type.

Agronomic Properties of Ammonium Nitrate Fertilizers

Ammonium nitrate is made from nitric acid and ammonia, both of which are produced at the synthetic nitrogen plants. The nitric acid appears in the ammonium nitrate as nitrate nitrogen and the ammonia as an equal amount of ammonia nitrogen. Ammonium nitrate fertilizers, therefore, represent a combination of the fertilizing properties of two of the best nitrogenous fertilizers, sodium nitrate and ammonium sulphate. It is much like two fertilizers combined in one. Actually, it contains as much nitrate nitrogen as the same quantity of sodium nitrate and in addition nearly as much ammonia nitrogen as the same quantity of ammonium sulphate. The fertilizing action and value under most conditions will be practically the same as that of an equivalent quantity of a mixture containing equal amounts of nitrate and ammonia nitrogen derived respectively from sodium nitrate and ammonium sulphate. It would, however, require 181 pounds of such a mixture to supply the amounts of nitrate and ammonia nitrogen supplied by 100 pounds of ammonium nitrate fertilizer. The ammonium nitrate fertilizer thus enjoys distinct advantages in regard to the amount of material that must be shipped and handled to supply a given amount of nitrogen and in reduced salt effect, making possible higher nitrogen applications without crop injury.

Like all nitrate nitrogen, that in ammonium nitrate moves with the soil moisture and may be leached by heavy rains or move to the surface in dry weather. The ammonia nitrogen in the compound, however, is just as resistant to leaching and movement in the soil as is that in ammonium sulphate. Unlike sodium nitrate which reduces soil acidity, ammonium nitrate is slightly acid-forming in the soil but develops only one-third as much acidity as an equivalent amount of ammonium sulphate or ammonium phosphate.

Field Tests of Nitrogen Carriers

The United States Department of Agriculture and many State experiment stations have conducted numerous tests of nitrogen sources for a wide variety of crops, including corn, cotton, potatoes, tobacco, apples and truck crops. The nitrogen sources studied included all the commonly used materials and some not commonly used. No detailed report on these experiments can be given here, but a few of them will be mentioned and some general conclusions drawn from an examination of the results of these experiments. In a ten-year tobacco experiment at Upper Marlboro, Maryland, nitrate nitrogen supplied as sodium nitrate, was superior in yield results in dry years to ammonia nitrogen alone, supplied as ammonium sulphate, while the reverse was true in wet years. During both dry and wet years a combination of the two forms of nitrogen, supplied as ammonium nitrate, produced still higher yields than either sodium nitrate or ammonium sulphate alone. Although the differences were not great, these results tend to show that ammonium nitrate is at least as

(Continued on page 24)

The Salesman the Important Factor in Post-War Industry*

WHEN the pressure for war material is released, it is both fortunate and inescapable that a considerable share of our swollen industrial employment can be absorbed by distribution services in the normal peacetime economy. For example, it is estimated that a plant now employing 6000 people in war production could reduce its personnel to 3000 when it resumes washing machine production, yet at the same time provide a livelihood for an equal number of people beyond the shipping platform. This was the pre-war condition and there is no reason to assume that the formula will be altered. For mass production of consumer durables cannot be maintained without the facilities for mass distribution, which involves transportation, warehousing, display, selling, financing, installation, and service. The end of the production line is a fanlike distribution web, reaching out hundreds of miles and finding anchorage in the homes of other workmen. That distribution web supports the production line in the factory and maintains its stability.

Production Needs Distribution

Most of the past and current discussion of post-war conversion problems has been focused on the problem of production. Relatively little consideration has been applied to the problems of distribution. Mass production methods have come to be accepted as a peculiarly American achievement. But it is frequently overlooked that mass production methods could not have been realized without the development of mass distribution.

Since production during the war has demonstrated its capacity to produce goods far in excess of any pre-war output, it seems self-evident that in the post-war years distribution will be confronted with the challenge of getting production to consumers on a larger scale than ever before, if post-war production and consumption are to approximate levels needed for higher living and substantially full employment.

Under these conditions of all-out war, these salesmen have been "the forgotten men." The one big customer—Government—has done the buying on a scale which far exceeds all previous concepts of industrial production and total employment. If anything approaching the same volume of manufacture is to be sustained post war, millions of individual buyers must take the place of the one big buyer. When the production of consumer goods is resumed and adequate stocks again become available, the volume of trade will again depend upon persuasiveness of salesmanship and convenience of purchase.

Salesmanship, therefore, must bear the brunt of the post-war challenge to the American system of free competitive enterprise. Being the vanguard of the army of 54,000,000 employed, the training and condition of the sales forces must not be deferred until the risk is again incurred of "too little and too late." Marketing executives must accept the responsibility now for aggressive planning and studied preparations.

It is the marketing and distribution managers of America, in closer collaboration with production and research executives, who must and will undertake to provide for manufacturing industry in peacetime the outlets which Government has supplied during the war.

The main problem for American distribution is to make itself more effective so that it will assure the distribution of large quantities of goods. The secondary problem is to make it more efficient so that unit distributive costs may be as low as possible, resulting in lower selling prices and large volume consumption.

Distribution Needs Selling

Much attention has been directed at *buying* power, but *wanting* power as stimulated by salesmanship and advertising, has nourished the tree of prosperity and produced its fruit. The urge to improve one's standard of living is the strongest stimulus to industry and thrift.

The forced draft of war production has stimulated further progress in manufacture technology and in refined craftsmanship. To furnish ample outlets for finer products at lower costs will, in the normal trend of human progress, require the *super-charging* of the industrial motive power by further stimula-

*Extracts from the Distribution Section of the Second Report of the Post-war Committee, National Association of Manufacturers.

tion of wants in order to reach higher altitudes in the scale of living.

Obsolescence will become an increasing factor in the total volume of production of consumer goods, impelled by the desire for improved models. A corollary result will be greater emphasis on the ways and means of disposing of used merchandise into second-hand markets.

The automobile has woven itself inextricably into the pattern of our lives, with far-reaching effects, not only on the improvement of streets and highways, but on retail trading areas, on suburban developments, and on travel facilities. Millions of people are employed directly by automobile manufacturers, and still more millions find employment by reason of the equipment and servicing and usage of those automobiles. All this has come about because the hardy pioneers in the development of the "horseless carriage" found other hardy enthusiasts who could influence people to buy the early product.

By what stretch of the imagination could it have been predicted thirty years ago that over 20,000,000 families in the United States would come to consider an automobile an essential possession? Who could have predicted twenty years ago that nearly 20,000,000 kitchens would be equipped with an automatic refrigerator, and that more than 30,000,000 radio receivers would be in American homes?

Lean on Distribution Research

Distribution executives should and will rely more heavily than ever before on the techniques of distribution research. Basically, distribution research, properly used, provides the means by which management can determine the wishes of its potential customers: what they will buy and what they will not buy; at what price level they will buy a specific commodity freely and at what price level they will buy in limited quantities, or not at all; whether markets are capable of expansion; what product improvements will increase utility or pleasure; and how costs of distribution can be progressively lowered in the interests of reduced prices to consumers. Distribution research, when it is effectively teamed with product research, may be industry's most effective—as it certainly is industry's most modern—machinery for measuring market possibilities and distribution efficiency.

In the extraordinarily complex task of continuous interpretation of consumer desires, we will see the developments and the application of new research methods such as:

a. The refinement and development of sampling techniques designed to improve the accuracy of surveys.
b. The consumer panel type of consumer research by which a fixed panel of families, chosen on a representative sample basis, supplies information at regular intervals on their purchases, buying habits, and attitudes towards products.
c. The use of small samplings of great intensity of the case study type, instead of large samplings with limited or superficial coverage.
d. The development and use of mechanical devices for application to such uses as the measuring of radio audiences and radio listener response and attitudes.

Alertness to changing conditions has always been an essential ingredient to profitable operation, but will pay exceptional premiums in the post-war transition.

Certain trends and developments appear to merit attention, in so far as they may affect plans and policies of individual enterprise, whether manufacturers of consumer goods or marketers of industrial products or purveyors of services.

Notably the total purchasing power of the public will probably be greater than that of post war, especially in the low-income brackets which will enjoy a higher percentage of total national income than before the war. This will mean a greater production of semi luxury items than before, with a corresponding increase in the importance of distributing outlets handling such items. Competition for the consumers' dollar above the level of the basic necessities will be keener than ever and will have corresponding effects on the distributing channels. For example, housing will actively compete with the travel desire, new and improved products in many lines will vie with established brands and new developments in durable consumer goods will alter the pattern of family expenditures.

Industrial Markets Also

Distribution research should be more generally applied in industrial marketing, as it has been in the field of consumer goods. The "industrial market" is generally held to include all distribution not covered in the consumer goods market, the latter being loosely defined as the distribution of goods and services in the form used in personal and family consumption. The industrial market includes not only capital goods going to all industrial and commercial concerns and utilities; it includes also the raw materials and

(Continued on page 20)

The News on Nitrogen*

By FIRMAN E. BEAR

EVERY first-class nation now has one or more factories for picking nitrogen out of thin air and tying it down in solid form for productive or destructive purposes, depending upon which, for the moment, is the more important. Today, with the great need for this element, both on the farm and on the battle front, the air-nitrogen factories are operating at full capacity.

This industry is now nearly 40 years old. It owes its origin to the suggestion of Sir William Crookes who, in 1898, directed the attention of the British Association for the Advancement of Science to its possibilities. His emphasis on the subject stemmed from the fear that the natural deposits of nitrate would soon be exhausted and that, when this had come to pass, the wheat-eating peoples of the earth would no longer be able to obtain adequate supplies of the "staff of life."

But war-minded men quickly saw in these air-nitrogen compounds the means for world conquest. Soon the race was on, each nation attempting to outbuild the other's nitrogen-fixing factories, the first step in the manufacture of explosives. When the first World War began, Germany was already quite independent of Chile. By the time this war has been won, the world's capacity to capture nitrogen from the air will have grown so enormously that we shall have difficulty finding use for these potential explosives in purely peaceful pursuits.

There was a time when soil organic matter was the only known source of nitrogen for crop use, primary dependence being placed on animal manures and cover crops to supply it. When the first nitrate shipments arrived in England, in 1830, no one knew of any use for this crude salt, and it was finally dumped into the sea. Yet, a few years afterwards, natural nitrate began to enjoy worldwide acceptance as a fertilizer, and the growth in its popularity was so rapid that it seemed certain the supply would soon be used up.

Beginning in 1858, however, sulphate of ammonia, a substitute for nitrate, became available as a by-product of the coking industry. In 1886, the discovery was made that the nodule bacteria on the roots of the clovers could accumulate nitrogen from the soil air. Finally, in 1905, the first commercial nitrogen-fixing factory came into existence. Now the nitrogen problem resolves itself largely into one of competition between the farm and the munition factory for the very large amounts of nitrogen materials that are available for use. As long as the war lasts, the supplies of these materials are likely to be somewhat less than could be used to advantage for both purposes. We might reduce our soil needs for nitrogen by growing larger acreages of clover and the other legumes for plowing-under purposes, but this would call for considerably heavier applications of phosphate and potash fertilizers than may be available for use, and for devoting food-producing land to a job which could better be done in a factory.

The present impressive list of air-nitrogen compounds, all of which can be used either as fertilizers or as explosives, includes nitrate of soda, nitrate of lime, calcium cyanamid, ammonium sulphate, ammonium phosphate, ammonium nitrate, and urea. Under pre-war conditions, the fruit grower could choose the one he preferred. Today, that choice is limited to whatever is left over after the needs of the munitions factories have been set aside, and after the fertilizer industry has been given its allotment for the production of mixed goods.

Over the years, farmers and fruit growers have become accustomed to using sodium nitrate, ammonium sulphate, and cyanamid, their choice depending partly upon the relative cost of nitrogen in these three forms and partly on their past experience with them. Today, in certain areas, we are asked to use ammonium nitrate instead. One important reason for this lies in the fact that a 100-pound bag of this product, containing 32.5 per cent nitrogen, will supply as much of this element as about 200 pounds of sodium nitrate, 160 pounds of ammonium sulphate, or 150 pounds of cyanamid. Its use will effect a great saving in shipping space, hauling, and labor, all very important matters in time of war.

Ammonium nitrate is not a new fertilizer, having long been sold under the trade name of "Cal-Nitro," a less concentrated product that was made to contain either 16 or 20 per cent nitrogen, depending upon whether it was to

*Reprinted from "American Fruit Grower," January, 1944.

be offered in competition with sodium nitrate or ammonium sulphate. An important reason for diluting the ammonium nitrate was that this helped to overcome its tendency to absorb moisture from the air and to dissolve in this accumulated water. Thus pure, white ammonium nitrate, when exposed to the air on a humid day, changed to a colorless liquid. If the product was dry when it left the factory, and if it was shipped in moisture-proof bags, it might arrive in good condition but, when the bags were opened, it soon became undrillable. Accordingly, the producers began experimenting with drying agents. This resulted in the production of a material that contained from 40 to 60 per cent calcium carbonate or pulverized limestone.

As soon as it became apparent that large quantities of the undiluted ammonium nitrate would be available for fertilizer use during this war, both governmental and industrial chemists set to work to find some better means of keeping it in good condition until it had been applied, and yet not diluting it to the extent to which this had previously been done. It was finally found that, by granulating the material, covering the granules with a wax-like material, and adding small amounts of a fine clay-like dust, a drillable product could be made whose handling qualities were quite similar to those of the modern forms of sodium nitrate. The bags in which this new product is being shipped are, of course, waterproofed. The material, of which that manufactured in the United States is known as "Ammonium Nitrate Fertilizer" and that from Canada as "Nitraprills," is now expected to reach the farm in excellent drilling condition and to stay that way, after the bag has been opened, for a considerably longer period than is necessary to apply it.

Quite naturally, many questions have arisen about ammonium nitrate. Is it as good a source of nitrogen as sodium nitrate, ammonium sulphate, or cyanamid? Since the product carries half its nitrogen in the same form as that in sodium nitrate and half in the same form as that in ammonium sulphate, it would seem that it has an advantage over either of these two materials used alone. A study of the many field comparisons of ammonium nitrate and the several other carriers of nitrogen indicates that this may be the case. Thus Bailey Brown, of the U. S. Department of Agriculture, averaged 27 tests on potatoes in Maine, New York, Pennsylvania, and Virginia, found that the acre-yield was 232 bushels where nitrate of soda was the source of the nitrogen, 235 where ammonium sulphate was the nitrogen carrier, and 241 bushels where ammonium nitrate was used instead. Certainly, the fruit grower can shift to the new product with confidence. If he has been accustomed to using 5 pounds of ammonium sulphate or cyanamid per tree, all he needs to do is to reduce the rate to 3 pounds per tree, and go ahead with ammonium nitrate. If he has been using sodium nitrate, he can cut his rate of application in half.

But we cannot get away from the fact that nitrate of soda does supply soda, that ammonium sulphate supplies sulphur, and that cyanamid supplies lime. If the soil conditions are such that one or the other of these three constituents is needed, the product that supplies it has an advantage. The 32.5 per cent grade of ammonium nitrate supplies nitrogen, but nothing else of value.

If any fruit grower needs more than nitrogen, and many of them do, the answer can be found in using complete fertilizers and, if necessary, supplementing these with lime. Such fertilizers usually contain large amounts of calcium and sulphur, and their potash will normally accomplish whatever effects can be credited to the soda of sodium nitrate. But even these complete fertilizers will contain from one-fourth to one-half of their nitrogen in the form of ammonium nitrate this year.

In general, nothing serious stands in the way of the fruit grower's fertilizer program. The supply of nitrogen fertilizers seems adequate to meet the normal needs for this element. The problem of drilling-quality of ammonium nitrate has been solved. If phosphate and potash have been used in the past, as required, one will get the desired effects from the use of ammonium nitrate. If they have not been used, and there is need for the extra elements which they supply, then this might be a good year to make a change to a complete-fertilizer program. In either case, there should be adequate supplies of fertilizer to meet all the more important needs for 1944.

Sulphur Production Still Decreasing

The production of sulphur in the United States during November, 1943, amounted to 192,014 tons. This is 26,000 tons less than September production and 7,000 tons less than October. Shipments during the month decreased to 229,219 tons. As producers' stocks on hand at the end of November totaled 4,514,859 tons, there is no immediate danger of a sulphur shortage.

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Principal Articles in This Issue

NITROGENOUS FERTILIZERS FOR DIRECT APPLICATION 5
THE SALESMAN THE IMPORTANT FACTOR IN POST-WAR INDUSTRY 8
NEWS ON NITROGEN 10
Price Differentials for Multiple Grades .. 12
Paper Bags Standardized 13
1943 Fertilizer Sales at New Peak 14
FERTILIZER MATERIALS MARKET:
New York 15
Baltimore 15
Charleston 17
Philadelphia 17
Tennessee Phosphate 18
Chicago 20

Price Differentials for Multiple Grades

Price differentials for multiple grades of fertilizer that may be produced at the manufacturer's discretion were announced on January 5th by the Office of Price Administration.

These differentials are to be used for determining maximum consumer prices for multiple grades containing more or fewer units of nitrogen, available phosphoric acid and potash. OPA had set specific prices for other grades approved by the War Food Administration, but, until January 5th, had made no provision for the multiple grades.

The prices now established are in line with those for the approved grades as well as with prevailing market prices, OPA said.

As an example of the use of differentials in establishing ceilings for multiple grades, OPA cites the following: In Schedule A, Maine, 5–10–5 (5 per cent nitrogen, 10 per cent available phosphoric acid, 5 per cent water soluble potash) is specified as an approved grade with a list price of $43.75 per ton. If a manufacturer desires, he may make a multiple grade of 5–10–5 such as 8–16–8 by adding to the price for the 5–10–5 differentials as follows:

	Per ton
Maximum price for 5–10–5	$43.75
Add 3 units nitrogen at $2.25	6.75
Add 6 units available phorphoric acid at $1.10	6.60
Add 3 units potash (from muriate) at $.75	2.25
Maximum price for 8–16–8	$59.35

The differentials are to be added to the list price in the schedule, and the price for the multiple grade is then subject to such freight quantity, cash and other discounts that prevail in each area.

Either as additions or deductions, the same differentials are to be used for pricing nitrogen-phosphate mixtures made as variations of the grade 4–16–0, and for pricing grades of superphosphate or potash salts not specifically priced in the regulation. The values given nitrogen, available phosphoric acid and potash are based upon average cost adjusted for discounts commonly applicable to the sale price.

Corrections of typographical errors and changes in the wording of the fertilizer regulation to conform with that used by the trade were also made.

The amendment became effective on January 11th.

Paper Bags Standardized

Multiwall paper sacks, characterized by trade experts as "the one basic trend in bulk packaging that has resulted from the war," are now standardized for all Government and many commercial purchases to achieve the most effective use of such containers in domestic and overseas shipments.

Comprehensive standards covering design, strength and other factors have been defined for the first time in the new Federal Specification UU-S-48, effective January 1st.

Government and industry technicians for the past year have been studying how to provide the best possible sacks with minimum consumption of materials. Collaboration of the National Bureau of Standards and the Conservation, Chemicals and Containers Divisions of WPB, with important assistance from the Paper Shipping Sack Manufacturers working through their industry advisory committee, has resulted in the issuance of Federal Specification UU-S-48, which stipulates standards for five types of sacks, covering strength, weight, acidity and stretch of plain and wet-strength papers, construction details and methods of testing quality of paper used. Factors to be considered in the selection of the most suitable types for a particular product are enumerated.

The new specifications are expected to relieve the current bottle-neck in steel, fiber and wooden drum shipping containers, while also providing important savings in cost of containers and in shipping weight and space. They also will enable manufacturers of multiwall shipping sacks to put their production on the most efficient basis by concentrating on certain standard types and by consuming the minimum of woodpulp and other precious materials. This will help industry to use the largest amounts of sacks possible under conditions of unprecedented demand for paper products.

Paper shipping sacks have been used for domestic shipping of cement, flour, fertilizer, etc., for many years. Experimental shipments of foodstuffs, chemicals, synthetic rubber and building materials in the Army and Navy and for the maintenance of civilian populations overseas have demonstrated the ability of properly designed sacks to withstand severe war shipping conditions. More than 300 different products are now being shipped in paper sacks with the list growing steadily. Approximately 1,100,000,000 multiwall paper sacks were produced in 1943.

Multiwall paper sacks have proved so satisfactory in war shipments that it is believed the trend toward their use will continue after the war.

Much of the credit for the wide adaptability of the sacks to current shipping problems is attributed to the practical suggestions made by the Paper Shipping Sacks Manufacturers' Industry Advisory Committee, consisting of: F. G. Bemis, Bemis Bros. Bag Co., Boston, Mass.; George Brown, the Raymond Bag Co., Middletown, Ohio; M. J. Davis, Hammond Bag & Paper Co., Wellsburg, W. Va.; William J. Dixon, St. Regis Paper Co., New York City; George N. Burns, Chase Bag Co., Toledo, Ohio; A. A. Scholl, Bagpak Inc., New York City; Walter F. Lipford, Strong Bag Co., Inc., Richmond, Va.

Manning Now Vice-President of I. M. C.

Announcement has been made of the election of Dr. Paul D. V. Manning to the position of vice-president of International Minerals & Chemical Corporation. Dr. Manning, who has been director of research, will be in charge of the research and experimental work of the company's various laboratories.

Louis Ware Elected Director of First National Bank of Chicago

Louis Ware, President of International Minerals & Chemical Corporation of Chicago, has been elected to the Board of Directors of the First National Bank of Chicago.

Mr. Ware has been President and Director of International since August, 1939. In 1941, the New York executive offices and Atlanta operating offices of the corporation were consolidated in new general offices in Chicago and the corporate name was changed in December of that year from International Agricultural Corporation to International Minerals & Chemical Corporation.

For more than 30 years, International has been the largest miner of phosphate rock in America and a leading manufacturer of fertilizer.

Under Mr. Ware's management, the corporation has expanded into new fields of operation. A potash mine was developed in New Mexico. New chemical plants were built in several cities. New phosphate mines were opened in Florida, Tennessee and Montana. The corporation purchased the business of the Amino Products Company of Detroit. It also designed, built and is operating for the Government a magnesium plant in Texas.

Mr. Ware has had long executive experience

in the mining, engineering and banking fields. He has been associated in a management capacity with important mining operations in the United States and in South America. For several years he was an executive of the New York Trust Company.

1943 Fertilizer Sales at New Peak

Sales of fertilizer tax tags in the 17 reporting States in 1943 represented the equivalent of 7,675,000 tons. Sales were substantially larger than in any preceding year, exceeding 1942, the previous peak, by 1,479,000 tons, or 24 per cent.

A particularly sharp rise in sales took place in the second half of the year, when large quantities of tags were bought for use in 1944. Sales in December were abnormally large for the month, being purchased in anticipation of the spring season and to take care of earlier buying on the part of farmers.

The increase in 1943 over 1942 was widespread, with all of the 17 States reporting increases. In the Southern region the increase amounted to 25 per cent, compared with a rise of 18 per cent in the Midwest.

Fertilizer consumption in the entire country probably exceeded 10,000,000 tons in 1943, not including the quantity distributed by AAA and TVA. Complete information will not be available until the Association's annual survey of consumption is completed several weeks hence.

ANNUAL FERTILIZER TAX TAG SALES

State	1938	1939	1940	1941	1942	1943
Virginia	405,179	418,089	393,069	399,377	420,668	487,038
North Carolina	1,104,788	1,215,887	1,076,730	1,150,343	1,243,612	1,414,454
South Carolina	660,963	678,859	685,310	729,447	698,704	890,493
Georgia	768,323	689,790	762,725	806,326	852,765	1,083,488
Florida	555,475	556,782	568,671	654,664	650,577	804,303
Alabama	528,850	562,100	575,900	581,500	574,150	780,050
Mississippi	325,836	318,761	319,508	368,667	377,082	495,239
Tennessee	128,291	130,354	147,311	141,461	174,298	230,818
Arkansas	67,800	74,122	101,000	125,100	140,458	182,865
Louisiana	148,542	160,488	156,775	182,010	173,241	214,768
Texas	84,276	95,226	118,199	142,666	133,974	186,510
Oklahoma	8,005	7,622	7,363	12,950	8,752	21,488
Total South	4,786,328	4,908,080	4,912,561	5,294,511	5,448,281	6,791,514
Indiana	235,297	263,145	302,750	340,161	436,679	496,380
Illinois	43,278	43,456	51,748	63,004	82,526	111,315
Kentucky	109,968	120,009	123,102	121,976	146,420	164,037
Missouri	70,301	67,733	87,577	86,964	70,937	95,592
Kansas	18,099	14,366	17,931	19,186	11,415	16,324
Total Midwest	476,943	508,709	583,108	631,291	747,977	883,648
Grand Total	5,263,271	5,416,789	5,495,669	5,925,802	6,196,258	7,675,162
Total U. S. Fertilizer Consumption*	7,547,917	7,765,619	8,302,464	9,240,497	10,005,238	.....

*Including fertilizer distributed by Government agencies.

BRADLEY & BAKER

FERTILIZER MATERIALS - FEEDSTUFFS

AGENTS - IMPORTERS - BROKERS

155 E. 44th Street
NEW YORK

BRANCHES

Clinton St. & Danville Ave.
Baltimore, Md.

505 Royster Building
Norfolk, Va.

1252 West Beaver Street
Jacksonville, Fla.

504 Merchants Exchange Bldg., St. Louis, Mo.

FERTILIZER MATERIALS MARKET

NEW YORK

Ammonium Nitrate to Be Available for Fertilizer in Larger Quantities. Shipping Shortage Cuts Nitrate of Soda Imports. No Increase in Potash Supplies Expected. Superphosphate Production Larger but Still Below Goal Set by Government.

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, January 11, 1944.

Sulphate of Ammonia

The recent difficulties undoubtedly decreased production of sulphate of ammonia somewhat but there seem to be ample supplies to take care of deliveries against previous allocations.

Ammonium Nitrate

With the prospects of larger quantities of ammonium nitrate being available from U. S. Army Ordnance Plants, the available quantities of this material will be about doubled. There should be a plentiful supply of inorganic ammonia to take care of all fertilizer requirements.

Nitrate of Soda

There has been some indication that, due to the lack of steamer space, previously estimated quantities will not be available, but in most quarters it is felt that probably nitrate of soda will be available as has been expected for some time.

Potash

According to latest advices, allocations for the third period will be made not later than February 1st. Manufacturers have managed to continue their deliveries as originally estimated in spite of scarcity of labor, but it is not expected that there will be any additional potash available for the second period, and third quarter allotments will probably be on the basis as originally expected.

Superphosphate

Production has increased and it now looks as if there will probably be six and a half million tons produced for the 1943–44 season, which however is considerably under the quantity which the Government mentioned as a possibility some time ago. With new plants having been authorized by the Government, and if supplies of sulphuric acid can be maintained in sufficient volume, the 1944–45 season should show considerable increase in superphosphate production. The West Coast is evidently in need of superphosphate, special need, according to Government reports, being in Washington and Oregon.

BALTIMORE

Good Demand for Complete Fertilizers Expected. Deliveries Proceeding per Schedule on Most Allocated Materials. Some Burlap Bags Available for Fertilizer Use.

Exclusive Correspondence to "The American Fertilizer"

BALTIMORE, January 11, 1944.

There have been no outstanding features in connection with the fertilizer situation during the past two weeks. Manufacturers are now prepared for the spring season and looking forward to a good demand for complete fertilizer.

Ammoniates.—Organic ammoniates such as tankage and blood are practically all going into the production of feeding materials, as the ceiling prices are higher than for fertilizer purposes.

Castor Pomace.—There is practically none of this material offering on the market, as producers are taking care of their regular trade and only definitely booking sales after they are certain what they will produce during the current month. The market remains unchanged at formerly mentioned ceiling price of $2.90 per unit of ammonia ($3.52½ per unit N), f. o. b. producer's works.

Sulphate of Ammonia.—There is no change in the situation and deliveries are still being allocated, the same as nitrate of soda.

Superphosphate.—No heavy stocks are accumulating, and manufacturers are taking care of their regular trade at ceiling price of 64 cents per unit of A. P. A. for run-of-pile, f. o. b. producers' works, Baltimore.

Fish Meal.—Practically all fish meal is now off the market and no longer considered available for fertilizer purposes.

FERTILIZER MATERIALS

LET US QUOTE YOU ON YOUR REQUIREMENTS OF THESE MATERIALS

✣

PHOSPHATE ROCK

✣

SUPERPHOSPHATE

✣

DOUBLE SUPERPHOSPHATE

✣

SULPHURIC ACID

✣

BONE MEALS

✣

DRIED BLOOD

✣

TANKAGES

✣

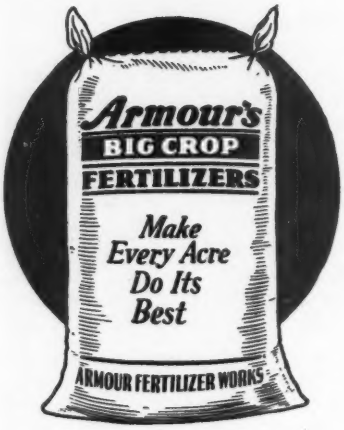
BONE BLACK

✣

PIGMENT BLACK

✣

SODIUM FLUOSILICATE



ARMOUR FERTILIZER WORKS

General Offices: Walton Building, Atlanta, Ga.

Division Sales Offices:

Albany, Ga.
Atlanta, Ga.
Augusta, Ga.
Baltimore, Md.
Birmingham, Ala.
Chicago Heights, Ill.
Cincinnati, Ohio
Columbia, S. C.
Columbus, Ga.
East St. Louis, Ill.
Greensboro, N. C.
Havana, Cuba
Houston, Texas
Jacksonville, Fla.
Montgomery, Ala.
Nashville, Tenn.
New Orleans, La.
New York, N. Y.
Norfolk, Va.
Presque Isle, Me.
San Juan, P. R.
Sandusky, Ohio
Wilmington, N. C.

Potash.—Producers are practically sold up and manufacturers are taking deliveries against contracts previously booked. It is calculated that domestic producers will be able to take care of legitimate manufacturing requirements of this country.

Bone Meal.—With the easing up in the shipping situation, business will sooner or later be resumed in the South American product, but until this comes on the market it is expected there will be a dearth of offerings.

Bags.—Owing to the scarcity of good second-hand bags and the fact it is impossible to ship any large size containers made of paper, it is now permissible for fertilizer manufacturers to ship in new burlap bags provided they secure necessary authority from the War Production Board. Importation of burlap is still under control of Governmental agencies, but it is anticipated that there will be a change in the situation shortly whereby bag manufacturers will resume importation of their own supplies.

CHARLESTON

Labor Shortage Hampers Production of Mixed Goods. Cottonseed Meal Allocated for Fertilizer but Supply Short.

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, January 10, 1944.

The shortage of labor is creating considerable difficulty to the manufacturers trying now to move mixed goods.

Organics.—The producers of nitrogenous are not yet making any further offerings, nor do they at this time know when they will be able to offer additional. The WPB has recently allocated fertilizer manufacturers 40 per cent of their allotments of cottonseed meal, but meanwhile it has developed that a sufficient supply is available only for feed orders.

Superphosphate.—It is still hoped that six and one-half million tons of 18 per cent superphosphate can be produced in the 1943–44 season, but not only is there a question as to whether the fertilizer manufacturers can obtain the necessary sulphuric acid but offerings of phosphate rock are becoming quite scarce.

Cottonseed Meal.—The prices on the 8 per cent grade are $49.50, Atlanta; $48.50, Memphis. However, actual offerings of cottonseed meal are scarce.

PHILADELPHIA

Coming Season Expected to Break All Records. Interest Centers on Material Production Figures. Shipments Proceeding on Allocations.

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, January 11, 1944.

It is expected that the coming year will be a record one for the fertilizer industry from the point of the amount produced and distributed. With large stocks already in the mixers' warehouses, the farmers are being urged to take delivery of their requirements as quickly as they can, to relieve the storage space.

This record is really a feather in the cap of the fertilizer industry, when one realizes the difficulties presented by shortages of materials and labor. Apparently everyone in the industry has taken the view: "Damn the torpedoes and full speed ahead."

Ammoniates.—The mixers seem to get along satisfactorily with their allocations of the inorganic materials, but the organic products still go chiefly to the feeding trade, and unfortunately there is too little even for that trade.

Sulphate of Ammonia.—This material continues, of course, under allocation, so that chief interest centers on production figures. The unsettled labor condition in the steel industry may have some effect on the production.

Manufacturers' Sales Agents for DOMESTIC

Sulphate of Ammonia

Ammonia Liquor :: Anhydrous Ammonia

HYDROCARBON PRODUCTS CO., INC.

500 Fifth Avenue, New York

Nitrate of Soda.—The domestic material will continue at the same price as before, for January shipments. Continues under allocation, but supply sufficient to take care of the allocations.

Superphosphate.—Production is holding well, and even some increase is looked forward to.

Bone Meal.—Some imported material gets into feeding channels, but the supply picture is none too bright.

Potash.—Production continues to hold up, and mixers are taking in all they are permitted under allocations.

TENNESSEE PHOSPHATE

Record Tonnage of Phosphate Rock Reported in 1943. All Plants Operating to Capacity. Bigger Output Expected in 1944.

Exclusive Correspondence to "The American Fertilizer"

COLUMBIA, TENN., January 10, 1944.

The year 1943 closed with the largest tonnage of phosphate from this field ever known. While exact figures are not obtainable, it is certain that well over 1,500,000 short tons was reached, of which over 200,000 tons was ground rock.

It is rather freely reported, though not yet officially announced, that the Victor Chemical Works will double its phosphorus furnaces at Mt. Pleasant beginning very soon.

There are three such furnace plants using rock from this field: 1. Victor at Mt. Pleasant, owning large tracts of phosphate lands in Maury and Giles Counties, but doing no mining at present and purchasing its supplies. 2. Monsanto, near Columbia, owning large areas and mining its own requirements except for occasional outside purchases of matrix. 3. TVA at Florence, Muscle Shoals, Ala., owning large areas, having its own mining, washing and sintering plants and also buying large amounts of outside rock, matrix and sinter.

There are two plants manufacturing treble superphosphate and phosphorus chemicals: Armour Fertilizer Works, who own large areas of phosphate lands, operate their own mines, washer and other plants and sell rock to their own fertilizer plants and those of other manufacturers; and International Minerals & Chemical Corp., who do the same both in Giles and Maury Counties, where they own large areas of phosphate land, and also in Hickman County.

The Virginia-Carolina Chemical Co. has one mixing plant at Mt. Pleasant and owns large tracts of land from which it mines large quantities of phosphate for its own plants, for manufacture of superphosphate, and for sale to other manufacturers. The Federal Chemical Co. has large areas of land with a large washing and drying plant at Ridley, near Mt. Pleasant, to which the crude phosphate is transported by rail in hopper cars from its Williamson County mines. Its product is rock for manufacture of superphosphate and for filler by its own manufacturing plants at Nashville, Louisville and at points in Ohio and Mississippi. The Hoover & Mason Phosphate Co. is the only company in the field independent of any manufacturing control, owning large areas at Mt. Pleasant, where it has a large washing, drying, grinding and bagging plant. Most of its output is sold for direct application by farmers through the Ruhm Phosphate & Chemical Co.

Press notices record activity in Williamson County, where some fourteen tracts are under option to a party dealing with the General Chemical Co. branch of Allied Dye & Chemical Co. of New York.

All signs point to a very active business for 1944 and several years to follow and investment interests are giving considerable attention to possibilities in this field as a safe and profitable place for their money.

PULVERIZED MASCOT LIMESTONE
Trade Mark Registered

MAGNESIUM LIMESTONE
"It's a Dolomite"
American Limestone Company
Knoxville, Tenn.

America's market basket depends on soil fertility

Vegetable crops remove relatively large amounts of potash from the soil. This vital plant nutrient must be replaced in order to insure both quantity and quality. And this has an important bearing on the mixing of fertilizers intended for use on these crops.

The American farmer is doing a bigger job than ever... and doing it magnificently! He's counting on your fertilizers to help him raise the bumper crops needed to feed our fighters, civilians and Allies. Your fertilizers, most of them compounded with potash, help plants to resist disease and drought.

Sunshine State Higrade Muriate of Potash, and other grades which you know, are of tremendous help in keeping America's market basket brimming over with the foods needed to hasten Victory.

ARMY E NAVY

SUNSHINE STATE POTASH PRODUCT OF NEW MEXICO U.S.A.

HIGRADE MURIATE OF POTASH 62/63% K_2O GRANULAR MURIATE OF POTASH 48/52% K_2O MANURE SALTS 22/26% K_2O

UNITED STATES POTASH COMPANY

TRADE-MARK REG. U. S. PAT. OFF.

CHICAGO

Producers of Fertilizer Organics Having Difficulties Filling Orders. Slight Improvement in Feed Situation.

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, January 10, 1944.

The local market in organics was strictly routine during the past two weeks. Inquiry was good, but no sales of consequence have been reported. Organic producers maintain their stocks are below normal, with the labor situation still acute. Back orders are being filled, under these conditions, to the sellers' best ability.

The shortage of manpower has affected the movement of feed materials, particularly with the heavy runs of livestock. However a slight improvement during the past week is worthy of mention.

Ceiling prices have not been changed.

High grade ground fertilizer tankage, $3.85 to $4.00 ($4.68 to $4.86 per unit N) and 10 cents; standard grades crushed feeding tankage, $5.53 per unit ammonia ($6.72 per unit N); blood, $5.38 ($6.54 per unit N); dry rendered tankage, $1.21 per unit of protein, Chicago basis.

Obituary

Dr. B. W. Kilgore

Dr. B. W. Kilgore, state chemist of North Carolina, died on December 27th following a short illness. Dr. Kilgore was nearly 77 years old and had been prominent in agricultural affairs in North Carolina and in the South for nearly 50 years. He was born in Mississippi, a graduate of Mississippi State College, class of 1888. He came to the North Carolina Experiment Station as assistant chemist in 1889. He was state chemist from 1899 to 1919, director of the Experiment Station from 1901 to 1925, director of the Extension Service 1914 to 1925, and dean of agriculture 1923 to 1925. He was editor of *The Progressive Farmer* for many years and one of its principal owners.

It was only at the urgent request of Commissioner Scott Kerr that he consented a few years ago to serve again as state chemist. Dr. Kilgore was held in the highest esteem by members of the fertilizer industry throughout the nation.

Carpenter Appointed Armour Vice-President

J. E. Sanford, president of Armour Fertilizer Works, has announced the appointment of A. H. Carpenter to the position of vice-president formerly held by the late W. J. Gray. Mr. Carpenter has been connected with the company for many years, having been Division Manager at Baltimore since 1928. He is succeeded at the Baltimore office by J. C. Bennett.

THE SALESMAN, THE IMPORTANT FACTOR IN POST-WAR INDUSTRY

(Continued on page 9)

semi-manufactured goods purchased by industry for fabrication.

As in the instance of the manufacturer of consumer goods, the end of the production line is not the factory of the manufacturer of the industrial goods, but in the end usage of the product. More intelligent and efficient application of manufacturing and distribution planning can be effected by distribution surveys and studies in advance of action.

Does Distribution Cost Too Much?

For 100 years the record has been one of progress—we have seen better goods produced at lower cost, more efficient production, lower unit cost of production, and increasingly effective and widespread distribution of goods and services.

The question of whether distribution costs too much has been discussed by many commentaries with greater or less acumen. The citizen consumer himself, it would appear, is much less perturbed about this matter than the social theorist. The consumer concerns himself only with the end results, the satisfaction of his wants within the limit of his means. He has seen the cost of an automatic refrigerator reduced from $500 to less than $200. Only the theorist berates the continuation of

STEDMAN FERTILIZER PLANT EQUIPMENT

Dependable for more than 50 Years

All-Steel Self-Contained Fertilizer Mixing Units
Batch Mixers—Dry Batching
Pan Mixers—Wet Mixing
Swing Hammer and Cage Type Tailings Pulverizers
Vibrating Screens
Dust Weigh Hoppers
Acid Weigh Scales

STEDMAN'S FOUNDRY & MACHINE WORKS AURORA INDIANA U.S.A. Founded 1884

Bemis MULTIWALL PAPER SHIPPING BAGS . . .

"SEWN WITH BEMIS SPECIAL THREAD, EH? SAY, THIS BAG IS CLOSED AS TIGHT AS A SCOTCHMAN'S POCKETBOOK"
"IT'S A SWELL ADVERTISEMENT..REGULAR BILLBOARD. AND BEMIS PRINTING MAKES IT STAND OUT ALMOST LIKE NEON LIGHTS"
"BEMIS MAKES ALL TYPES OF MULTIWALL BAGS — SEWN OR PASTED, VALVE OR OPEN-MOUTH"
"WHEN YOU SEE THE BEMIS BAG-MAKER'S CERTIFICATE, ON A BAG, YOU CAN BET IT EXCEEDS THE CONSOLIDATED FREIGHT CLASSIFICATION REQUIREMENTS. PLENTY TOUGH, SURE 'NOUGH"
Your Brand
"IF YOU NEED A REAL WATERPROOF, MOISTUREPROOF BAG, BEMIS HAS IT"
"BEMIS BAGS ARE TAILOR-MADE TO YOUR REQUIREMENTS"

CALL IN THE BEMIS MULTIWALL PAPER BAG EXPERT

Bemis has a staff of Multiwall Paper Bag experts which are at your service whether you are a Bemis customer or not. Call upon us any time you have a troublesome packaging problem. You'll find the Bemis Man an expert on all phases of such problems, whether it be bag design, bag closing equipment, shipping or storing bags. Let him study your packaging operations. He may suggest ways to increase output, lower man power, cut costs or reduce waste. His call will cost you nothing and place you under no obligation.

BEMIS BAGS

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BETTER BAGS FOR 86 YEARS

a percentage markup which has been little, if any, reduced over the same course of years. The consideration commonly overlooked is that the cost of distribution, per unit of sale, in dollars, has likewise been reduced about two-thirds, along with the reduction of selling price. The consumer is interested only in the final price tag and in being able to satisfy his wants at less cost, measured in fewer hours of his own earnings.

We may expect to see a great increase in the total volume of goods purchased by the public, which, with higher total consumer buying power than in pre-war years, will demand a greater variety of goods and a greater number of services. This means that society as a whole may be paying out an increasing proportion of the national income for distribution and for distribution services. For society as a whole, increased total payments in an expanding economy for distribution and for distribution services, when they result from public demand for variety of either goods or services, are a necessary accomplishment of higher living standards.

In general, the cost of distribution is an important factor in the price of goods and to the extent that unit costs of distribution can be lowered by improved methods, prices can be lowered, and consumption increased, and the public will promote it.

There is, however, no magic nor obvious shortcut to radically lowered distribution costs. The basic elements of distribution costs in the past are the necessary elements of distribution costs in the future, and these cannot be reduced by wishful thinking, by economic ineptness, nor by bureaucratic interference.

Rebuilding Distribution

In order that there may be the highest practicable sustained effective consumption in the post-war period, it is obvious that the objective cannot be accomplished without the utmost contribution to the joint effort by distribution. This contribution cannot be made without preparation of a very high order.

Individual companies have the major responsibility to seek answers to their own post-war distribution problems. They should not rely on trade associations or other organizations, or the Government, to give them ready-made answers to their individual post-war problems.

The wartime period of forced disruption in itself affords the great opportunity for each company to consider whether post-war distribution should be conducted in the same way as its pre-war distribution. It may be many years before the vast bulk of manufacturing companies will have a comparable opportunity to consider whether sound lines of distribution require a reshaping of distribution methods—in other words, when changes could be devised with less need for breaking up an existing organization and personnel. War has so disorganized sales organizations that they must of necessity be rebuilt. It should be realized, moreover, that if and when former employees return from their war activities, they and new employees in the same field will need specialized training.

In the immediate post-war rush to promote sales, many manufacturers will seek to get into the retailing field much more than before, for example, paint, wallpaper, home appliances, radio. In general, the tendency of manufacturers to go into direct consumer distribution will not be so marked as the tendency of wholesalers and retailers to integrate.

Changes in servicing methods facilities are likely to occur. For example, one control service organization in a community might service several different makes of home appliances, instead of each distributor maintaining a separate service crew. This trend started before the war and has been accelerated by the manpower shortages during the war.

Distributed by Government

Demobilization will be followed by the need for the Government to dispose of large quantities of surplus goods, and such disposition may, if not properly regulated, swamp civilian markets and disorganize for a long period the normal function of both the production and distribution of certain goods.

Governmental interference with the free movement of goods became an increasing problem prior to the war; especially during the 'thirties there was a steady and disturbing

Fertilizer Machinery *AND* Acidulating Equipment

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Cleveland, Ohio
Detroit, Mich.
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Greensboro, N. C.
Havana, Cuba
Henderson, N. C.
Montgomery, Ala.
Norfolk, Va.
No. Weymouth, Mass.
Pensacola, Fla.
Pierce, Fla.
Port Hope, Ont., Can.
Presque Isle, Me.
Savannah, Ga.
Searsport, Maine
South Amboy, N. J.
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Henderson, N. C.
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Laurel, Miss.
Montgomery, Ala.
Montreal, Quebec, Can.
New York, N. Y.
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Pensacola, Fla.
Pierce, Fla.
Port Hope, Ont., Can.
St. Paul, Minnesota
Savannah, Ga.
Spartanburg, S. C.
Wilmington, N. C.

trend towards such control of distributive activities, which was reflected in the numerous laws—federal, state and local—which were enacted. These laws and regulations were of three main types:

1. Those commonly designated as state and local trade barriers, intended to protect enterprises within a given area from the competition of other enterprises outside that area. Examples are state and local load limitations on trucks, state and local licenses restricting the work of salesmen, and local building regulations which restrict the "outside" materials even though cheaper, even though in some instances they were enacted to accomplish other purposes.
2. Those that used tax powers to restrain competition. Notable examples were the chain store tax laws and the oleomargarine taxes.
3. Those intended to preserve "fair competition." The outstanding examples were the Federal Trade Practice laws, the State Price Maintenance laws, and State Unfair Sales Acts which prohibited sales below "cost."

There is much reason to believe that the trend toward such laws, temporarily stalled because of war conditions, will be revived after the war. Every such law is put on the statute books primarily because a particular group fears competition. The self-interest of those who want such "protection" should be opposed by business leaders or legislators who have a strong feeling of responsibility for the over-all public interest in eliminating such clots in the arteries of distribution. All such laws and regulations in the long run tend to add to the cost of distribution, and it is the consumer who pays the bill.

Every such law, unless genuinely justified on the ground of public welfare, is a blow at free enterprise. One such law begets another, and in the end all business suffers from the paralyzing effect which such legislation has on distributive activities.

Co-operatives

Farm co-operatives both for the marketing of farm products and to a lesser degree for the purchase of farm supplies, have had a steady growth for many years, and there is every reason to believe that this growth will continue.

Consumer's co-operatives will probably continue to grow, but for a long time to come will probably not handle a significantly large proportion of consumers' purchases.

Cottonseed Meal Production

The U. S. Bureau of Census reports production of cottonseed cake and meal amounting to 1,127,355 tons during the first part of the present crop year, from August 1st to December 31st. This compares with 1,204,243 tons during the same months of 1942. Shipments during the same period of 1943 totaled 1,078,243 tons, leaving stocks on hand of 67,654 tons at the end of the year.

Vermont Fertilizer Consumption

According to L. S. Walker, chemist in charge, Regulatory Service, Vermont Experiment Station, total fertilizer sales in that state for the fiscal year ended June 30, 1943, were 18,690 tons. The leading grades were: 4–10–10, 4,341 tons; 3–12–6, 3,001 tons; 0–14–14, 2,641 tons; 6–15–15, 2,015 tons; 4–9–7, 1,558 tons; and 20 per cent superphosphate, 1,244 tons. These six grades included 80 per cent of the total tonnage.

NITROGENOUS FERTILIZERS FOR DIRECT APPLICATION

(Continued from page 7)

effective as the other two forms. Twenty-three cotton experiments in the Carolinas gave about the same indications. Ammonium nitrate was sometimes a little better than the other sources tried (sodium nitrate, ammonium sulphate and urea) and sometimes not quite so good. A typical corn experiment conducted from 1921 to 1939 at Stoneville, Mississippi, gave the following average acre yields of corn with various nitrogen sources applied prior to planting: no nitrogen, 21.4; ammonium nitrate, 37.4; sodium nitrate, 36.3; ammonium sulphate, 34.8; and cyanamid, 33.9 bushels. Again ammonium nitrate is

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Information and references available on request.

AMERICAN POTASH & CHEMICAL CORPORATION
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Pioneer Producers of Muriate of Potash in America

See Page 4

about the equivalent or slightly better than the other sources.

B. E. Brown of this Bureau recently summarized the results of 27 nitrogen source experiments with potatoes in Maine, Long Island, Pennsylvania and Virginia. Weighted averages showed that ammonium nitrate, sodium nitrate, ammonium sulphate, ammonium chloride and urea had produced 241, 232, 235, 237 and 238 bushels per acre, respectively. Ammonium nitrate is, thus, a satisfactory source of nitrogen for potatoes and as efficient in increasing yields as the other sources studied.

There is, therefore, reason to expect that crops in general will respond as well to nitrogen applied as ammonium nitrate as to other forms of chemical nitrogen. The substitution of ammonium nitrate for these other forms means no sacrifice in yields and the large supplies of this material available mean that many acres can be top-dressed that would otherwise have had to go unfertilized.

The question has frequently been raised as to whether the coatings used to protect ammonium nitrate from moisture absorption and caking might not seriously reduce its availability to plants and result in slow crop response. Results, in both greenhouse and field experiments, indicate that crop response to coated ammonium nitrate is not delayed relative to that from uncoated ammonium nitrate or from sodium nitrate.

Explosion and Fire Hazard

It is unfortunate that the impression has become established in some sections that ammonium nitrate is a dangerous material to handle due to its explosive properties and that it presents undue fire hazards. R. O. E. Davis of this Bureau has recently surveyed the explosion and fire hazard of this material. His findings may be summarized as follows: Ammonium nitrate can be made to explode by strong detonation such as may be produced by dynamite or a more powerful explosive, and enters more readily into explosive reactions when mixed with readily combustible substances such as organic matter. (The strong detonation required is difficult to produce even by intention and is extremely improbable under farm conditions.) The farmer who handles his ammonium nitrate fertilizers with the same care that he uses in handling other nitrogen fertilizers need have no fear of explosions.

Thin layers or small piles of ammonium nitrate by itself cannot be made to burn except by the application of an outside source of heat. Large piles of the material, however, can be made to support their own combustion but such fires are not readily started. Large quantities of ammonium nitrate in a burning building tend to increase greatly the severity of the fire just as sodium nitrate does.

Bags in which ammonium nitrate fertilizers have been stored or shipped are inflammable and should be destroyed, as should also bags that have contained sodium nitrate, especially if made of paper. Farmers frequently wish to keep cloth or burlap bags for use for other purposes and such bags, if they have contained nitrates, should be washed free of the nitrate by prolonged soaking and repeated rinsing with fresh water.

Low Cost Nitrogen

The present farm prices of sodium nitrate, ammonium sulphate and ammonium nitrate were found for one southeastern point to be $41.20, $39.74 and $59.80, respectively, per ton. If each of these prices is divided by the nitrogen content as follows:

$$\frac{\$41.20}{16}, \frac{\$39.75}{20.5}, \text{ and } \frac{\$59.80}{32.5},$$

it is found that the cost of a unit of nitrogen (20 pounds) is $2.57, $1.94 and $1.84, respectively. Thus, ammonium nitrate is the cheapest source of nitrogen at this point, although it costs more per ton. Prices of each of these materials vary considerably in different parts of the country, but in general it will be found that ammonium nitrate is one of the least expensive forms of nitrogen that the farmer can buy.

Conclusions

Supplies of chemical nitrogenous fertilizers for direct use for the coming season will be equivalent to about 271,000 tons of nitrogen, or about one-third more than was available in the season just past. Smaller amounts of ammonium sulphate will be available but this will be more than offset by increased amounts of Uramon, Cal-Nitro, ammonium phosphate and ammonium nitrate. The latter material is relatively unfamiliar to the fertilizer consumer and its properties have been discussed in some detail. With the exercise of reasonable care, the new ammonium nitrate fertilizers can be stored, shipped and distributed in the field without trouble. The ammonium nitrate fertilizers are among the lowest cost sources of nitrogen that can be obtained at present. Crops in general respond as well to them as to other forms of chemical nitrogen.

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BUYERS' GUIDE • A CLASSIFIED INDEX TO ALL THE ADVERTISERS IN "THE AMERICAN FERTILIZER"

This list contains representative concerns in the Commercial Fertilizer Industry, Including fertilizer manufacturers, machinery and equipment manufacturers, dealers in and manufacturers of commercial fertilizer materials and supplies, brokers, chemists, etc.
For Alphabetical List of Advertisers, see page 33.

ACID BRICK
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

ACID EGGS
Chemical Construction Corp., New York City.

ACIDULATING UNITS
Chemical Construction Corp., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

AMMO-PHOS
American Cyanamid Co., New York City.

AMMONIA—Anhydrous
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Hydrocarbon Products Co., New York City.

AMMONIA LIQUOR
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Hydrocarbon Products Co., New York City.

AMMONIA OXIDATION UNITS
Chemical Construction Corp., New York City.

AMMONIATING EQUIPMENT
Sackett & Sons Co., The A. J., Baltimore, Md.

AMMONIUM NITRATE SOLUTIONS
Barrett Division, The, Allied Chemical & Dye Corp., New York City.

AUTOMATIC ELEVATOR TAKEUPS
Sackett & Sons Co., The A. J., Baltimore, Md.

BABBITT
Sackett & Sons Co., The A. J., Baltimore, Md.

BAGS AND BAGGING—Manufacturers
Bagpak, Inc., New York City.
Bemis Bro. Bag Co., St. Louis, Mo.
St. Regis Paper Co., New York City.
Textile Bag Mfrs. Association, Chicago, Ill.
Union Bag & Paper Corporation, New York City.

BAGS—Cotton
Bemis Bro. Bag Co., St. Louis, Mo.
Textile Bag Mfrs. Association, Chicago, Ill.

BAGS—Paper
Bagpak, Inc., New York City
Bemis Bro. Bag Co., St. Louis, Mo.
St. Regis Paper Co., New York City.
Union Bag & Paper Corporation, New York City.

BAGS (Waterproof)—Manufacturers
Bemis Bro. Bag Co., St. Louis, Mo.
St. Regis Paper Co., New York City.
Textile Bag Mfrs. Association, Chicago, Ill,
Union Bag & Paper Corporation, New York City.

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

BAG CLOSING MACHINES
Bagpak Inc., New York City.
St. Regis Paper Co., New York City.

BAGGING MACHINES—For Filling Sacks
Atlanta Utility Works, East Point, Ga.
Bagpak, Inc., New York City.
St. Regis Paper Co., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

BAG PILERS
Link-Belt Company, Philadelphia, Chicago.

BEARINGS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

BELT LACING
Sackett & Sons Co., The A. J., Baltimore, Md.

BELTING—Chain
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

BELTING—Leather, Rubber, Canvas
Sackett & Sons Co., The A. J., Baltimore, Md.

BOILERS—Steam
Atlanta Utility Works, East Point, Ga.

BONE BLACK
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Huber & Company, New York City.

BONE PRODUCTS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

BORAX AND BORIC ACID
American Potash and Chem. Corp., New York City
Pacific Coast Borax Co., New York City.

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Dickerson Co., The, Philadelphia, Pa.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Keim, Samuel L., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

BUCKETS—Elevator
Link-Belt Company, Philadelphia, Chicago
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 33

BUCKETS—For Hoists, Cranes, etc., Clam Shell, Orange Peel, Drag Line, Special; Electrically Operated and Multi Power
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.

BURNERS—Sulphur
Chemical Construction Corp., New York City.

BURNERS—Oil
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.

CABLEWAYS
Hayward Company, The, New York City.

CARBONATE OF AMMONIA
American Agricultural Chemical Co., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.

CARS—For Moving Materials
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARTS—Fertilizer, Standard and Roller Bearing
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

CASTINGS—Acid Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.

CASTINGS—Iron and Steel
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CEMENT—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

CHAIN DRIVES—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAINS AND SPROCKETS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAMBERS—Acid
Chemical Construction Corp., New York City
Fairlie, Andrew M., Atlanta, Ga.

CHEMICAL APPARATUS
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

CHEMICALS
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
Bradley & Baker, New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Huber & Company, New York City.

CHEMICALS—Continued
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Phosphate Mining Co., The, New York City.
Wellmann, William E., Baltimore, Md.

CHEMICAL PLANT CONSTRUCTION
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Stillwell & Gladding, New York City.
Wiley & Company, Baltimore, Md.

CLUTCHES
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind

CONCENTRATORS—Sulphuric Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CONDITIONERS AND FILLERS
American Limestone Co., Knoxville, Tenn.
Dickerson Co., The, Philadelphia, Pa.
Phosphate Mining Co., The, New York City

CONTACT ACID PLANTS
Chemical Construction Corp., New York City

COPPER SULPHATE
Tennessee Corporation, Atlanta, Ga.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

CRANES AND DERRICKS
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

CYANAMID
American Agricultural Chemical Co., New York City
American Cyanamid Co., New York City.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Jett, Joseph C., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

DENS—Superphosphate
Chemical Construction Corp., New York City.
Stedman's Foundry and Mach. Works, Aurora, Ind.

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BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 33

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Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

DRYERS—Direct Heat
Sackett & Sons Co., The A. J., Baltimore, Md.

DRIVES—Electric
Link-Belt Company, Philadelphia, Chicago.

DUMP CARS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

DUST COLLECTING SYSTEMS
Sackett & Sons Co., The A. J., Baltimore, Md.

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Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

ELEVATORS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ELEVATORS AND CONVEYORS—Portable
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ENGINES—Steam
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

EXCAVATORS AND DREDGES—Drag Line and Cableway
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Link Belt Speeder Corp., Chicago, Ill., and Cedar Rapids, Iowa.

FERTILIZER MANUFACTURERS
American Agricultural Chemical Co., New York City.
American Cyanamid Company, New York City.
Armour Fertilizer Works, Atlanta, Ga.
Farmers Fertilizer Company, Columbus, Ohio.
International Minerals and Chemical Corporation, Chicago, Ill.
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

FOUNDERS AND MACHINISTS
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

GARBAGE TANKAGE
Wellmann, William E., Baltimore, Md.

GEARS—Machine Moulded and Cut
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

GEARS—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

GELATINE AND GLUE
American Agricultural Chemical Co., New York City.

GUANO
Baker & Bro., H. J., New York City.

HOISTS—Electric, Floor and Cage Operated, Portable
Hayward Company, The, New York City.

HOPPERS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

IRON SULPHATE
Tennessee Corporation, Atlanta, Ga.

INSECTICIDES
American Agricultural Chemical Co., New York City.

LACING—Belt
Sackett & Sons Co., The A. J., Baltimore, Md.

LIMESTONE
American Agricultural Chemical Co., New York City.
American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

LOADERS—Car and Wagon, for Fertilizers
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Duriron Co., Inc., The, Dayton, Ohio.
Fairlie, Andrew M., Atlanta, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Coal and Ash Handling
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, East Point, Ga.
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Grinding and Pulverizing
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 13

MACHINERY—Power Transmission
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Pumping
Atlanta Utility Works, East Point, Ga.
Duriron Co., Inc., The, Dayton, Ohio.

MACHINERY—Tankage and Fish Scrap
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MAGNETS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MANGANESE SULPHATE
McIver & Son, Alex. M., Charleston, S. C.
Tennessee Corporation, Atlanta, Ga.

MIXERS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

NITRATE OF SODA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
Bradley & Baker, New York City.
Chilean Nitrate Sales Corp., New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

NITRATE OVENS AND APPARATUS
Chemical Construction Corp., New York City.

NITROGEN SOLUTIONS
Barrett Division, The, Allied Chemical & Dye Corp., New York City.

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
DuPont de Nemours & Co., Wilmington, Del.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Smith-Rowland Co., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.

PACKING—For Acid Towers
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

PANS AND POTS
Stedman's Foundry and Mach. Works, Aurora, Ind.

PHOSPHATE MINING PLANTS
Chemical Construction Corp., New York City.

PHOSPHATE ROCK
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Coronet Phosphate Co., New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Phosphate Mining Co., The, New York City.
Ruhm, H. D., Mount Pleasant, Tenn.
Schmaltz, Jos. H., Chicago, Ill.
Southern Phosphate Corp., Baltimore, Md.
Virginia-Carolina Chemical Corp. (Mining Dept.), Richmond, Va.
Wellmann, William E., Baltimore, Md.

PIPE—Acid Resisting
Duriron Co., Inc., The, Dayton, Ohio.

PIPES—Chemical Stoneware
Chemical Construction Corp., New York City.

PIPES—Wooden
Stedman's Foundry and Mach. Works, Aurora, Ind.

PLANT CONSTRUCTION—Fertilizer and Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

POTASH SALTS—Manufacturers
American Potash and Chem. Corp., New York City.
Potash Co. of America, New York City.
International Minerals & Chemical Corp., Chicago, Ill.
United States Potash Co., New York City.

PULLEYS AND HANGERS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

PUMPS—Acid-Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., New York City.
Wellmann, William E., Baltimore, Md.

QUARTZ
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

RINGS—Sulphuric Acid Tower
Chemical Construction Corp., New York City.

ROUGH AMMONIATES
Bradley & Baker, New York City.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 33

SCALES—Including Automatic Bagging
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SCRAPERS—Drag
Hayward Company, The, New York City.

SCREENS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SEPARATORS—Air
Sackett & Sons Co., The A. J., Baltimore, Md.

SEPARATORS—Including Vibrating
Sackett & Sons Co., The A. J., Baltimore, Md.

SEPARATORS—Magnetic
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SHAFTING
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SHOVELS—Power
Link-Belt Company, Philadelphia, Chicago.
Link-Belt Speeder Corporation, Chicago, Ill., and Cedar Rapids, Iowa.
Sackett & Sons Co., The A. J., Baltimore, Md.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

SPROCKET WHEELS (See Chains and Sprockets)

STACKS
Sackett & Sons Co., The A. J., Baltimore, Md.

SULPHATE OF AMMONIA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Hydrocarbon Products Co., New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

SULPHUR
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Freeport Sulphur Co., New York City.
Texas Gulf Sulphur Co., New York City.

SULPHURIC ACID
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M. Charleston, S. C.

SULPHURIC ACID—Continued
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
International Minerals & Chemical Corporation, Chicago, Ill
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

SYPHONS—For Acid
Monarch Mfg. Works, Inc., Philadelphia, Pa.

TALLOW AND GREASE
American Agricultural Chemical Co., New York City.

TANKAGE
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Smith-Rowland, Norfolk, Va.
Wellmann, William E., Baltimore, Md.

TANKAGE—Garbage
Huber & Company, New York City.

TANKS
Sackett & Sons, Co., The A. J., Baltimore, Md.

TILE—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

TOWERS—Acid and Absorption
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

UNLOADERS—Car and Boat
Hayward Company, The, New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

UREA
DuPont de Nemours & Co., E. I., Wilmington, Del.

UREA-AMMONIA LIQUOR
DuPont de Nemours & Co., E. I., Wilmington, Del.

VALVES—Acid-Resisting
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

WHEELBARROW (See Carts)

ZINC SULPHATE
Tennessee Corporation, Atlanta, Ga.

ALPHABETICAL LIST OF ADVERTISERS

For Classified Index, See Pages 28 to 32, Inclusive

American Agricultural Chemical Co., New York City....23
American Cyanamid Co., New York City.. 3
American Limestone Co., Knoxville, Tenn..18
American Potash and Chemical Corp., New York City....4, 25
Armour Fertilizer Works, Atlanta, Ga.....16
Ashcraft-Wilkinson Co., Atlanta, Ga. Front Cover
Atlanta Utility Works, East Point, Ga....22

Baker & Bro., H. J., New York City.....—
Barrett Division, Allied Chemical & Dye Corporation, New York City...Back Cover
Bemis Bro. Bag Co., St. Louis, Mo.....21
Bradley & Baker, New York City.....14

Charlotte Chemical Lab., Charlotte, N. C..—
Chemical Construction Corp., New York City....25
Chilean Nitrate Educational Bureau, New York City....34

Dickerson Co., The, Philadelphia, Pa.....—
Dougherty, Jr., E., Philadelphia, Pa.....33
Du Pont de Nemours & Co., E. I., Wilmington, Del.....—
Duriron Company, Dayton, Ohio.....—

Fairlie, Andrew M., Atlanta, Ga.....29
Farmers Fertilizer Co., Columbus, Ohio...34
Freeport Sulphur Co., New York City....—

Gascoyne & Co., Inc., Baltimore, Md.....34

Hayward Company, The, New York City..34
Huber Co., L. W., New York City.....—
Hydrocarbon Products Co., New York City.17

International Minerals & Chemical Corporation, Chicago, Ill.....—

Jeffrey Manufacturing Co., The, Columbus, Ohio.....—
Jett, Joseph C., Norfolk, Va.....—

Keim, Samuel D., Philadelphia, Pa.....33

Link-Belt Company, Chicago, Ill.....—

McIver & Son, Alex. M., Charleston, S. C..27

Monarch Mfg. Works, Inc., Philadelphia, Pa.....34

Pacific Coast Borax Co., New York City..—
Phosphate Mining Co., The, New York City.....—
Polk Co., R. L., Detroit, Mich.....27
Potash Co. of America, New York City 3rd Cover
Ruhm, H. D., Columbia, Tenn.....34

Sackett & Sons Co., The A. J., Baltimore, Md.....24
Schmaltz, Jos. H., Chicago, Ill.....34
Shuey & Company, Inc., Savannah, Ga...34
Smith-Rowland Co., Norfolk, Va.....—
Southern Phosphate Corp., New York City.—
Stedman's Foundry and Machine Works, Aurora, Ind.....20
Stillwell & Gladding, New York City.....34
St. Regis Paper Co., New York City. 2nd Cover
Synthetic Nitrogen Products Co., New York City.....—

Tennessee Corporation, Atlanta, Ga.....27
Texas Gulf Sulphur Co., New York City.. 4
Textile Bag Mfrs. Association, Chicago, Ill..—

Union Bag & Paper Corp., New York City—
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.....25
United States Potash Co., New York City.19

Virginia-Carolina Chemical Corp., Mining Dept., Richmond, Va.....—

Wellmann, William E., Baltimore, Md....27
Wiley & Company, Inc., Baltimore, Md...34

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